

Chiral Amine Synthesis

Since amines are ubiquitous in natural products (e.g., alkaloids) as well as in synthetic compounds, and because asymmetric synthetic procedures are now used routinely in organic chemistry laboratories (thanks to the impressive progress made in the last few years), the recent book *Chiral Amine Synthesis* edited by Thomas C. Nugent will undoubtedly be of interest to a very broad community of organic chemists. The major importance of this wide-ranging topic would at first glance make it seem an overwhelming task to review every aspect of this area in a single book. Upon embarking on such an ambitious project, the main difficulty probably lies in choosing which of the many available methods should be included. Why should one particular method be emphasized and not another? Indeed, one might expect some readers to be highly critical of a book that fails to cover their favorite methods. Although the editor remains rather vague about the reasons for choosing the topics of the different chapters, the intention of reporting only recent results (less than ten years old) is clearly stated, and that could explain some apparent omissions. Thus, it should be noted that most of the references cited by the authors of the chapters are for the period 2000–2009.

Having made these choices, Thomas Nugent finally presents a very pleasant book, which can be useful for chemists from the academic world and from industry, for university teachers who wish to set up a new course, and for researchers and students who simply want an overview of the subject or some particular details of the methods employed.

The book is organized in 14 chapters written by scientists from Asia, Europe, and North America, all of whom are specialists in the topics covered. Many chapters deal with asymmetric addition to imines. The asymmetric addition of nucleophiles to imines is, of course, a very widely used method, which is nicely reviewed in the first chapter of this book. It is one of the largest chapters with numerous references. In contrast, Chapter 2 is much more modest and describes a comparatively unusual but interesting reaction, asymmetric radical addition to imines. Reactions for asymmetric addition to imines by hydrogenation (Chapter 6) and by hydrosilylation (Chapter 4), vinylogous Mannich reactions (Chapter 5), reductive amination reactions (Chapter 7), and the aza-Morita-Baylis-Hillman reaction (Chapter 13) are all described at considerable length. The other methods covered include the enantioselective hydrogenation of enamines (Chapter 8), of enamides (Chapter 9), and of nitrogen-based heteroaromatics

(Chapter 10), as well as asymmetric hydroamination (Chapter 11) and C–H activation (Chapter 12). Two chapters describe the use of chiral Brønsted acid catalysts (Chapter 3) and of biocatalysts (Chapter 14) for the asymmetric synthesis of amines.

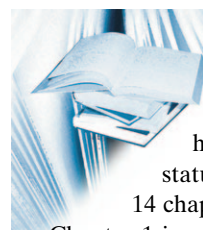
It is evident that asymmetry aspects govern the methodology chosen for the preparation of a chiral amine. Thus, the book particularly emphasizes methods based on asymmetric catalysis, as they appear to be quite efficient, atom-economical, and elegant.

The chapters contain a great wealth of information, and this book will certainly provide useful guidelines for synthetic chemists. The presentation is excellent, and each chapter ends with a series of short exercise questions for students. A few chapters also include some representative experimental procedures.

In conclusion, this is a very clearly presented and well-organized book, which goes to considerable effort to simplify the reader's comprehension of a complex area of research. It will probably be a reference book for years to come, and can be recommended to teachers, research scientists, and students.

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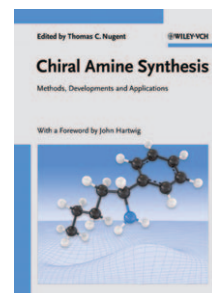


Industrial Biotechnology

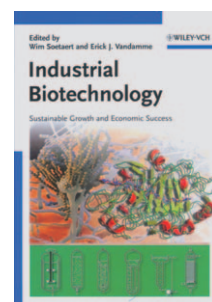
Is it possible to give a comprehensive survey of the current status of industrial biotechnology in 14 chapters? We shall see.

Chapter 1 is a historical review, describing the journey from the first antibiotics to monoclonal antibodies and modern biopharmaceuticals. Then a long second chapter gives a clear and informative description of metabolic engineering, taking bioethanol production—a well-established process—as an example. The chapter also describes how the situation for a product undergoing development of an already established process (example: propanediol) differs from that for a relatively new product (succinic acid).

Chapter 3 provides a rather brief discussion of fermentation technology. Here it would have been helpful to include a short comparison of the many different fermentation options, in the form of a chart showing advantages and disadvantages with regard to process convenience and economy.



Chiral Amine Synthesis
Methods, Developments and Applications. Edited by Thomas C. Nugent. Wiley-VCH, Weinheim 2010. 494 pp., hardcover € 159.00.—ISBN 978-3527325092



Industrial Biotechnology
Sustainable Growth and Economic Success. Edited by Wim Soetaert and Erick J. Vandamme. Wiley-VCH, Weinheim 2010. 500 pp., hardcover € 159.00.—ISBN 978-3527314423

Directed evolution methods and assay development on important enzyme classes, with an emphasis on stereoselectivity, are summarized in Chapter 4. All the important developments in the last few years are discussed briefly and compared in a comprehensive chart.

The title of Chapter 5, “The Industrial Production of Enzymes”, is somewhat misleading, as the largest part of the article is concerned with applications in the paper, leather, and detergent industries. Only a small part actually deals with the production of the biocatalyst. A similar criticism applies to Chapter 6, “Applied Biocatalysis: An Overview”, since instead of applications we find a discussion of various reactor types, immobilized biocatalysts, and unconventional media.

Chapter 7 has “Nanobiotechnology” as its theme, and covers a broad variety of topics ranging from spider silk to biosynthetic hybrids and to molecular machines based on DNA. In my opinion, the discussion of biosensors and biochips is too brief in view of their increasing importance.

Chapter 8, “Downstream Processing in Industrial Biotechnology”, is well-written, useful, and informative. A concise introduction is followed by a discussion of all the relevant techniques with important examples. Intermediates for the chemical and pharmaceutical industries are the subject of Chapter 9. Classical examples such as β -lactam building blocks and statin side-chains are treated in considerable detail, but a somewhat longer chapter covering a broader selection would have been desirable in view of the importance of this rapidly growing field.

Biotechnology in everyday life means baking, cheese-making, and beer-brewing, as well as the numerous possibilities for the modification of starch. A comprehensive review of these topics is presented in Chapter 10. However, amino acids are only discussed briefly, and it is surprising that vitamins are not covered at all, apart from a small section in Chapter 1, the historical review.

The next chapter contains a concise discussion of paper and pulp applications. That is followed, in Chapter 12, by a detailed review of biofuels. Besides the focus on bioethanol and biodiesel, this includes recent developments such as BtL (biomass-to-liquid) processes, and the conversion of biomass into coal slurry or products equivalent to synthesis gas. The challenges faced in work

towards the development of an integrated biorefinery are also discussed.

Chapter 13 discusses environmental and economic aspects, for products such as acetic acid, lactic acid, ethanol, and various others. Emission of greenhouse gases, energy consumption, and many more parameters play important roles in building a bio-based industry. This is discussed in the context of a “cradle to grave” methodology for some products and processes as examples, indicating further challenges.

Somewhat surprisingly for a science book, the last chapter deals with societal aspects of biotechnology. Faced with an ever-increasing world population, the conflict between food production and biofuel production is of crucial importance. The discussions are often controversial and emotional, and tend to cite conflicting data from different sources. The GMO debate of the last few years shows the ever-increasing complexity of these questions. This part of the book offers a multifaceted and rational view on these aspects.

The citations in the book are quite up-to-date, the indexing is straightforward, the frequency of mistakes is low, and the structure is logical, apart from the position of Chapter 8 on “Downstream Processing in Industrial Biotechnology”, which would have been better placed following Chapter 3.

What is the target readership for this book? It certainly includes students of advanced courses who seek a broad overview of the scientific, environmental, and economic aspects of biotechnology. Experts in the field will, at first glance, not find many new things, but a more thorough reading will lead to a realization that the evaluation of processes has interconnections with wider scientific, environmental, and economic issues, as well as societal concerns that might not be very obvious from a purely scientific viewpoint.

The question raised at the beginning of this review can therefore be answered with an emphatic: Yes! However, a few topics deserved more space.

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